

WHY STUDY AEROSOLS

The behavior of aerosols affects the world around us, and explains many natural phenomena

In Life:

- Why is the sky blue?
- Why is the sunset red?
- Why does the moon appear orange sometimes and white other times?
- Why is there haze in the Smoky Mountains and why is it blue?
- What determines how far you can see?
- Why do colors fade to gray on the horizon?
- Why are there clouds in the sky and why do clouds sometimes dissipate?
- Why does it rain? What determines the size of the drops?
- Why can you see stars at night but not in the day?
- Why can you “see your breath” and why does the breath-cloud dissipate but clouds in the sky don’t dissipate?
- Why do ceilings and painted walls get discolored over time?
- Why are old fans and air conditioners always so filthy?
- What color is the sky on a clear day on Mars? On planets outside our solar system?
- How fast can you coast downhill on your bicycle? Or fall while skydiving?
- How far will you go if you push off from the side of a swimming pool?
- How does a curveball work; what causes it to break or a fastball to hop?
- If the moon had an atmosphere like the earth’s and you jumped off the top of the moon’s Empire State Building, would you be hurt? Could you decide without running the experiment?
- How likely is “nuclear winter”?
- How do biological agents move through homes and buildings?
- How would you measure the dispersion of anthrax spores through a Senate building?
- What can be done to control population exposures to chemical weapons?
- How could you protect yourself from an anthrax exposure?

In Air Pollution Control

- How do particles get into the atmosphere?
- What sizes of particles will be picked up by the wind?
- What changes in size or properties do the particles undergo while there?
- What determines how long particles stay in the atmosphere? How far will these particles travel?
- How are particles in the atmosphere related to the earth’s heat balance and the mean global temperature? Can particles cause global warming?
- How are particles removed from the atmosphere?
- How should you sample particles in gas flowing through a duct?
- How can you clean a gas stream of particles effectively but inexpensively?
- Why are particles harmful to humans?
- Why was the fallout from the collapse of the World Trade Towers harmful?

In Industrial Hygiene

- What sizes and concentrations of particles are found in the workplace; how do you know?
- Where do these particles come from?
- What can be done to prevent the generation of these particles?
- How can you measure the sizes and concentrations of these particles?
- How can you determine whether exposure to these particles is a hazard?
- Why do some particles collect in lung airways and cause health effects, whereas other particles are breathed in and back out again?
- How do you protect mail handlers from biological agents in envelopes? Which handlers are most at risk?

In Industry

- What determines where pharmaceutical powders deposit in the respiratory system?
 - What properties should the powders have to deposit where they are needed?
- How can contamination of the surroundings be prevented? This is especially important in the chemical industry (e.g., pesticides) and the pharmaceutical industry (biologically active chemicals)
- How can contamination of the product be prevented? For example, microelectronics
- How can processes be made more effective or cost efficient? For example, spray driers or aerosol reactors
- How can dust explosions be prevented?
- How do you design a clean room? How do you design a biohazard containment area?